AMENDMENTS TO THE SPECIFICATION

Please amend the Title of the application as follows:

Please delete ~~CONNECTOR~~ and substitute therefor A CONNECTOR HOUSING ASSEMBLY WITH A FIT-ON DETECTION MEMBER.

Please replace Paragraphs [0003], [0005], [0025], [0026], [0029], [0032], [0034], [0036], [0037], [0038], [0039], [0040], [0041], [0042], [0043], [0044], [0045], [0046], [0047], [0048], [0050], [0051], [0053], [0054], [0055], [0056], [0057], [0058], [0059], [0060], [0062], [0063], [0064], and [0065], with the following paragraphs rewritten in amendment format:

[0003] Many connectors have a detection device to determine if the connections are secured onto one another. Whether a ~~male~~ first or ~~female~~ second connector housing is used, fit-on detection is accomplished by utilizing an elastic deforming operation of a locking arm. Thus, whether or not the ~~male~~ first or ~~female~~ second connector housings have been normally fit on each other is detected according to whether the fit-on detection member can be pressed into a flexing space of the locking arm. More specifically, while an operation of fitting the ~~male~~ first connector housing and the ~~female~~ second connector housing to each other is being performed, the locking arm is in a deformed state. Therefore, even though the fit-on detection member attempts to be pressed into the flexing space, the fit-on detection member interferes with the locking arm. On the other hand, when the locking arm returns to its original position due to elastic deformation in consequence of a normal fit-on of the ~~male~~ first and ~~female~~ second connector housings, the flexing space expands and thus the fit-on detection member can be pressed into the flexing space.

[0005] It is necessary to release the initial position holding mechanism in consequence of the normal fit-on of the ~~male~~ first and ~~female~~ second connector housings. In Japanese Patent

Application laid-Open No. 2001-297827, a construction is disclosed to release the initial position holding mechanism provided on a mating connector housing (~~male~~ first connector housing). A rib is formed inside a hood part of the ~~male~~ first connector housing. The initial position holding mechanism is released when the initial position holding mechanism contacts the rib. However, the initial position holding mechanism is formed exclusively for the release of the initial position holding mechanism. Thus the provision of the initial position holding mechanism forces alteration of the ordinary construction of the ~~male~~ first connector housing. Thus, the construction, including the initial position holding mechanism does not have general-purpose properties.

[0025] Fig. 1 is an exploded perspective view showing a ~~female~~ second connector housing according to an embodiment of the present invention.

[0026] Fig. 2 is a partial cutaway plan view showing an initial state of a fit-on between ~~male~~ first and ~~female~~ second connector housings.

[0029] Fig. 5 is a partial cutaway plan view showing the state of the fit-on between ~~male~~ first and ~~female~~ second connector housings while an operation of fitting both connector housings on each other is being performed.

[0032] Fig. 8 is a partial cutaway plan view showing the state of the fit-on between ~~male~~ first and ~~female~~ second connector housings while an operation of fitting both connector housings on each other is being performed.

[0034] Fig. 10 is a partial cutaway plan view showing the normal state of the fit-on between ~~male~~ first and ~~female~~ second connector housings.

[0036] An embodiment of the present invention will be described below with reference to Figs. 1 through 11. The connector of the embodiment includes a ~~male~~ first connector housing 10 and a

~~female~~ second connector housing 20 capable of fitting on the ~~male~~ first connector housing 10. In the description below, the fit-on side of the ~~male~~ first connector housing 10 and that of the ~~female~~ second connector housing 20 are set as the front.

[0037] Initially the ~~male~~ first connector housing 10 is described below (see Fig. 3). The ~~male~~ first connector housing 10 has a rectangularly cylindrical hood part 11 projecting forward. Unshown tabs of the ~~male~~ first terminal fittings project from inside the hood part 11. A locking projection 12, corresponding to locking arm contact portion of the present invention, is disposed at the center, in a widthwise direction, of the ~~male~~ first connector housing 10. The locking projection projects inward, inside the hood part 11, from a front edge of the hood part 11. A tapered surface 12A is formed at a lower front end of the locking projection 12. The tapered surface 12A enables the locking projection 12 to easily ride across a connection locking piece 28 of a locking arm 22, which will be described later, to fit the ~~male~~ first connector housing 10 and the ~~female~~ second connector housing 20 on each other.

[0038] A rear surface of the locking projection 12 is formed almost vertically to an upper wall of the hood part 11. The ~~real~~ rear surface serves as a locking portion 12B to lock the ~~male~~ first connector housing 10 and the ~~female~~ second connector housing 20 to each other in a normal fit-on state.

[0039] The ~~female~~ second connector housing 20 will be described below. The ~~female~~ second connector housing 20 can be fitted [[on]] in the hood part 11 of the ~~male~~ first connector housing 10. The ~~female~~ second connector housing 20 accommodates unshown ~~female~~ second terminal fittings. When the ~~female~~ second connector housing 20 and the hood part 11 of the ~~male~~ first connector housing 10 are in a normal fit-on state, the ~~male~~ first and ~~female~~ second terminal fittings are fittingly connected to each other.

[0040] As shown in Fig. 1, a cantilevered locking arm 22 is formed on the upper surface of the ~~female~~ second connector housing 20 at the central part thereof in the widthwise direction of the ~~female~~ second connector housing 20. The locking arm 22 is elastically vertically deformable toward a flexing space 25 formed between the upper surface of the ~~female~~ second connector housing 20 and the locking arm 22.

[0041] The locking arm 22 has two long and narrow arm parts 24 erected from a front end of the ~~female~~ second connector housing 20 and extending rearward parallel with the upper surface of the ~~female~~ second connector housing 20. At the rear end of the arm parts 24, the locking arm 22 has a locking arm operation part 26 bridging the two arm parts 24. At a predetermined position, forward from the rear end of the arm parts 24, the locking arm 22 has a connection locking piece 28 bridging the two arm parts 24. An upper surface of the connection locking piece 28 is flush with the upper surface of the arm parts 24. A lower surface of the connection locking piece 28 projects downward in a predetermined dimension from the arm parts 24.

[0042] A window 27, into which the locking projection 12 can be dropped, is formed between the locking arm operation part 26 and the connection locking piece 28. A tapered surface 28A, across which the locking projection 12 rides in fitting the ~~male~~ first connector housing 10 and the ~~female~~ second connector housing 20 on each other, is formed on the upper edge of the connection locking piece 28. When the locking projection 12 rides across the tapered surface 28A, and the ~~male~~ first connector housing 10 and the ~~female~~ second connector housing 20 are normally fit on each other, the locking projection 12 drops into the window 27. The ~~male~~ first connector housing 10 and the ~~female~~ second connector housing 20 are locked to each other in the normal fit-on state as shown in Fig. 9. To enable a fit-on detection member 30 to elastically smoothly deform outwardly, a tapered surface 28B parallel with the tapered surface 28A is

formed in a lower part of a rear surface of the connection locking piece 28. Tapered surfaces 28C and 28D (see Figs. 4 and 7) are formed in a lower part of both side surfaces of the connection locking piece 28, respectively. The outward elastic deformation of the fit-on detection member 30 is described in detail below.

[0043] A protection wall 29 having a predetermined length is erect rearward from a front end of the ~~female~~ second connector housing 20 on the upper surface of the ~~female~~ second connector housing 20. The protection wall 29 is disposed at both sides of the locking arm 22 in the widthwise direction of the ~~female~~ second connector housing 20. The protection wall 29 has a height almost equal to that of the locking arm 22. The protection wall 29 is formed to prevent an external force from being applied to the locking arm 22. Thus, when the ~~male~~ first connector housing 10 and the ~~female~~ second connector housing 20 are in a normal fit-on state, the ~~male~~ first connector housing 10 and the ~~female~~ second connector housing 20 are prevented from being unlocked from each other. In this embodiment, a protruded part 29A is formed inward at the upper end of the protection wall 29 to prevent an upward deviation of the fit-on detection member 30, which will be described later. The inner surface of the protection wall 29 is formed as a slide surface 29B for the fit-on detection member 30 when it is pressed into the flexing space 25.

[0044] The fit-on detection member 30 detects whether the ~~male~~ first connector housing 10 and the ~~female~~ second connector housing 20 are in the normal fit-on state. The fit-on detection member 30 is mounted in a region surrounded by the protection wall 29 and within the height of the flexing space 25 formed between the upper surface of the ~~female~~ second connector housing 20 and the locking arm 22. The fit-on detection member 30 is approximately U-shaped. The fit-on detection member 30 includes a pair of elastic arms 32 and a web 34 connecting the elastic

arms 32 to each other. The fit-on detection member 30 is capable of elastically deforming outward.

[0045] A position of the fit-on detection member 30 mounted on the ~~female~~ second connector housing 20 is hereinafter referred to as its initial position. At the initial position, to enable the fit-on detection member 30 to be elastically deformable outward, a predetermined gap is formed between the inner surface of the protection wall 29 and an outer surface of the fit-on detection member 30 disposed forward from an outward projected part 37 of the fit-on detection member 30 which will be described later. The front end of the web 34 is held at a position proximate to a base portion 23 of the locking arm 22 to prevent the fit-on detection member 30 from moving forward. At the initial position, a locking projection 40, formed on the outer surface of each of the elastic arms 32 and in the vicinity of the web 34, engages a rearward movement prevention projection 42 formed on the ~~female~~ second connector housing 20. Thus, a rearward movement of the fit-on detection member 30 is prevented.

[0046] In ~~the~~ this embodiment, the ~~male~~ first connector housing 10 and the ~~female~~ second connector housing 20 are in a normal fit-on state if it is determined that a forward pressing operation of the fit-on detection member 30 can be performed by moving rearward from the initial position.

[0047] More specifically, while an operation of fitting the ~~male~~ first connector housing 10 and the ~~female~~ second connector housing 20 on each other is being performed, the operation of pressing the fit-on detection member 30 forward cannot be performed. When the ~~male~~ first connector housing 10 and the ~~female~~ second connector housing 20 have reached the normal fit-on state, the operation of pressing the fit-on detection member 30 forward can be accomplished. In the embodiment, whether the forward pressing operation of the fit-on detection member 30

can be performed depends on whether the elastic arm 32 elastically deforms outward. The mechanism of the elastic outward deformation of the elastic arm 32 is described below.

[0048] An inclined surface 32A corresponding to guide surface of the present invention, is formed on each of the opposed surfaces of the elastic arms 32. When the locking arm 22 elastically deforms downward, the inclined surface 32A is capable of sliding in contact with the connection locking piece 28 of the locking arm 22. As shown in Fig. 4, at the time of the start of the sliding operation of the inclined surface 32A, the distance (width) between the opposed surfaces of the elastic arms 32 becomes a little larger than the width of the lower surface of the connection locking piece 28. At the time of the finish of the sliding operation of the inclined surface 32A, the distance between the opposed surfaces of the elastic arms 32 becomes a little smaller than the width of the lower surface of the connection locking piece 28. Because of this construction, an elastic downward deformation of the locking arm 22 is interlocked with a forced elastic deformation of the elastic arm 32 along the upper surface of the ~~female~~ second connector housing 20. Thus, the connection locking piece 28 slides in contact with the inclined surface 32A disposed at the inner side of the elastic arm 32, elastically deforming the elastic arm 32 outward in a horizontal direction (widthwise direction). As will be described below, due to the flexing of the locking arm 22, the fit-on detection member 30 moves rearward as well. During the rearward movement of the fit-on detection member 30, a minimum movable range of the inclined surface 32A in a front-to-back direction is secured to allow the elastic arm 32 to keep elastically deforming outward. The inclined surface 32A is formed over the entire range of the opposed surfaces of the elastic arms 32.

[0050] A pair of outward projected parts 37, corresponding to receiving portion of the present invention, is formed outward from each inward projected part 36. At the initial position, the

outward projected part 37 does not contact a rear end 29C, corresponding to locking portion of the present invention, of the protection wall 29. Thus, the fit-on detection member 30 is not locked to the protection wall 29 (see Fig. 2). While the operation of fitting the ~~male~~ first connector housing 10 and the ~~female~~ second connector housing 20 on each other is being performed, the elastic arm 32 deforms elastically outward. Thus, an outer surface 37A, corresponding to stopping surface of the present invention, disposed in the vicinity of the outward projected part 37 contacts the rear end 29C of the protection wall 29. Accordingly, the fit-on detection member 30 is locked to the protection wall 29.

[0051] An approximately rectangular fit-on detection member operation part 38 is disposed rearward from the inward projecting part 36 of each of the elastic arms 32. The fit-on detection member operation part 38 is thinner than the inward projecting part 36 and provides an escape space for the locking arm operation part 26 when the locking arm 22 deforms elastically during fitting operation of the ~~male~~ first connector housing 10 and the ~~female~~ second connector housing 20 on each other (see Fig. 6). A rear right end of the left-hand fit-on detection member operation part 38 and a rear left end of the right-hand fit-on detection member operation part 38 are stepped respectively.

[0053] In the initial state before the ~~male~~ first connector housing 10 and the ~~female~~ second connector housing 20 are fit on each other, as shown in Figs. 2 through 4, the fit-on detection member 30 is mounted on the ~~female~~ second connector housing 20 at its initial position.

[0054] In this state, the ~~female~~ second connector housing 20 is fitted on the hood part 11 of the ~~male~~ first connector housing 10. While the operation of fitting the ~~male~~ first connector housing 10 and the ~~female~~ second connector housing 20 on each other is being performed, as shown in Figs. 5 through 7, the locking projection 12 contacts and interferes with the connection locking

piece 28. Consequently the locking arm 22 elastically deforms downward. At this time, the tapered surface 28B, disposed at the lower part of the rear surface of the connection locking piece 28, slides in contact with the inclined surface 36A of the inward projected part 36, and the fit-on detection member 30 moves rearward relatively to the locking arm 22. At this time, the connection locking piece 28 slides in contact with the inclined surface 32A of the elastic arm 32, and the elastic arm 32 elastically deforms outwardly. At this time, the locking projection 40 is unlocked from the rearward movement prevention projection 42. Thereby the fit-on detection member 30 is allowed to move rearward.

[0055] While the operation of fitting the ~~male~~ first connector housing 10 and the ~~female~~ second connector housing 20 on each other is being performed, the connection locking piece 28 is disposed between the elastic arms 32. Thus, the elastic arm 32 is prevented from elastically deforming inward or returning to its original state. Consequently the interference between the protection wall 29 and the outward projecting part 37 is maintained, and the connection locking piece 28 interferes with the inclined surface 36A. The interference securely prevents the forward pressing operation of the fit-on detection member 30 from being performed.

[0056] When the ~~male~~ first connector housing 10 and the ~~female~~ second connector housing 20 are placed in the normal fit-on state, as shown in Figs. 8 and 9, the locking projection 12 rides across the connection locking piece 28 and does not interfere with it. Thus, the locking arm 22 returns to its original state due to its elastic deformation. Consequently the locking arm 22 and the ~~male~~ first connector housing 10 are locked to each other. Accordingly, the ~~male~~ first connector housing 10 and the ~~female~~ second connector housing 20 are held in the normal fit-on state.

[0057] In this state, the connection locking piece 28 is disposed away from the inclined surfaces 32A and 36A, and there is no interference between the protection wall 29 and the outward projected part 37 and between the connection locking piece 28 and the inclined surface 36A. In this state, as shown in Figs. 10 and 11, an operator can perform the forward pressing operation of the fit-on detection member 30. Thus, the operator can securely detect that the ~~male~~ first connector housing 10 and the ~~female~~ second connector housing 20 are in the normal fit-on state. When the fit-on detection member 30 has reached a detection position, the locking projection 40 again engages the rearward movement prevention projection 42.

[0058] To remove the ~~male~~ first connector housing 10 and the ~~female~~ second connector housing 20 from each other, the locking arm operation part 26 is elastically deformed to unlock the locking projected portion 12 from the window part 27 of the locking arm 22. Thereafter the ~~male~~ first connector housing 10 and the ~~female~~ second connector housing 20 are pulled apart from each other.

[0059] As described above, in the above-described embodiment, when the fit-on detection member 30 can be shifted to the detection position in the operation of fitting the ~~male~~ first connector housing 10 and the ~~female~~ second connector housing 20 on each other, the operator finds that the ~~male~~ first connector housing 10 and the ~~female~~ second connector housing 20 have fitted on each other in the normal state. On the other hand, when the fit-on detection member 30 cannot be shifted to the detection position because of the interference between the fit-on detection member 30 and the protection wall 29 in the operation of fitting the ~~male~~ first connector housing 10 and the ~~female~~ second connector housing 20 on each other, the operator finds that the ~~male~~ first connector housing 10 and the ~~female~~ second connector housing 20 are fitted on each other in an abnormal state.

[0060] According to the connector having this construction, the addition of the fit-on detection mechanism does not necessitate an altered construction of the ~~male~~ first connector housing 10.

[0062] The fit-on detection member 30 has elastic arms 32 which are forcibly deformed, while the fitting operation of the ~~male~~ first connector housing 10 to the ~~female~~ second connector housing 20, on each other, is being performed. Therefore while the operation of fitting the ~~male~~ first connector housing 10 and the ~~female~~ second connector housing 20 on each other is being performed, the fit-on detection member 30 has a shape different from the shape at the time when the ~~male~~ first connector housing 10 and the ~~female~~ second connector housing 20 are fitted on each other in the normal state. Accordingly the operator can easily discriminate an abnormal fit-on state from the normal fit-on state.

[0063] In the connector of the embodiment, when the elastic arm 32 elastically deforms outward because the fit-on operation is being performed, the rear end 29C of the protection wall 29 locks the outer surface 37A (stopping surface) disposed in the vicinity of the outward projected part 37. Therefore the protection wall 29, which is an ordinary construction of the ~~female~~ second connector housing 20, can be effectively utilized to detect whether or not the ~~male~~ first connector housing 10 and the ~~female~~ second connector housing 20 have been normally fitted with each other.

[0064] In the connector of the embodiment, at the initial position, the fit-on detection member 30 is held at a position proximate to the base portion 23 of the locking arm 22. In the connector of the embodiment, when the locking arm 22 flexes during the operation of fitting the ~~male~~ first connector housing 10 and the ~~female~~ second connector housing 20 on each other, the fit-on detection member 30 moves rearward. That is, at the initial position, the fit-on detection member 30 is accommodated compactly in the flexing space 25 but the moving stroke of the fit-on

detection member 30 is long while the operation of fitting the ~~male~~ first connector housing 10 and the ~~female~~ second connector housing 20 on each other is being performed. Therefore it is possible to prevent the connector from becoming large in the front-to-back direction. Further, in the connector of the embodiment, the elastic arm 32 is capable of elastically deforming outward in a widthwise direction of the fit-on detection member 30, thus contributing to the decrease in the height of the connector.

[0065] The present invention is not limited to the embodiment described above with reference to the drawings. For example, the following embodiments are included in the technical scope of the present invention. Further, various modifications of the embodiments can be made without departing from the spirit and scope of the present invention.

(1) In the above-described embodiment, the locking projection 12 (locking arm contact portion) flexes the locking arm 22. Instead, any construction that flexes the locking arm 22 can be used as the locking arm contact portion. For example, the edge of the open portion of the ~~male~~ first connector housing 10 can be used to flex the locking arm 22.

(2) In the above-described embodiment, the fit-on detection member 30 deforms elastically outward in a horizontal direction. Instead it is possible to deform the fit-on detection member 30 outward elastically in a vertical direction.

(3) In the above-described embodiment, while the operation of fitting the ~~male~~ first connector housing and the ~~female~~ second connector housing on each other is being performed, the fit-on detection member 30 moves rearward relatively to the locking arm 22. Instead of this construction, at the initial state, the fit-on detection member 30 may be situated at a waiting position rearward from the detection position by a predetermined length.

(4) In the above-described embodiment, the fit-on detection member 30 elastically deformed is locked to the protection wall 29. However, the protection wall 29 is not an indispensable portion. Thus the fit-on detection member 30 may be locked to a portion of the ~~female~~ second connector housing 20.

(5) In the above-described embodiment, the locking arm 22 is cantilevered. However, the locking arm 22 may be supported at two points.

(6) In the above-described embodiment, the locking arm 22 has the two arm parts 24. Instead the locking arm 22 may have one arm part 24.